Effects Of Proprioceptive Training Program (PTP) On the Selected Physical Fitness Components and Playing Abilities of Novice TennisPlayers.

A

SYNOPSIS

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CHAPTER I

INTRODUCTION

Fitness is an essential component in the concept of wellness which might be defined as persistent endeavor to achieve highest probability for total well-being. The basic concern is human movement, primarily in the sense of larger movements rather than the more minutes or finer movements of body. More specifically, physical education is concerned with the relation between human movement and other areas of education that is, with the relationship of the body's physical development to the mind and soul as they are being developed. This concern for the effect of physical development and other areas contributes to the uniqueness broad scope of physical development for the broadest possible view of that field.

A well-balanced athlete has good coordination and control when performing sports actions. When a player absorbs a hit in Cricket, football, Hockey or Tennis, it is clear that maintaining balance is difficult. Air resistance, friction, and gravity also affect how well an athlete can maintain balance. The way in which an athlete resists and handles these outside forces is called stability. The better and more sports persons specifically athletes‟ train their bodies, the more balance and stable they will be during sports performance,and in the recent years the term that is very much related to balance is 'PROPRIOCEPTION'.

SPORTS

Sports is commonly stated as a muscular activity or ability and involves a grade of competition, such as Tennis or Basketball. Sports is mostly considered a primarily physical efforts, involving the organizing of our body responses to compete a variety of specialized, demanding physical task. Physical attributes are highly rewarded in competitive sports. Recognizing the abundant physical component of sports performance, scientists have highlighted the role of sports success as vital for translating research finding into interventions designed to enhance the physical performance capabilities of the athletes. Sports includes all forms of competitive, physical activity through casual or organized participation, aim to use, and skills while providing enjoyment to participants, and in some cases, entertainment for spectators.

In Racket sports such as Tennis, Table Tennis and Badminton require a combination of physiological requirements like speed, resistance, strength, motor coordination, short-term maximal

efforts, game-based techniques and strategies. These demands make the racket sports particularly challenging for athletes at different levels such as professional, amateur and beginner.

TENNIS

Tennis, in its simplest form, merely involves hitting a ball over a net. This is done, of course, within a specified area and using an implement called a racket. The addition of an opponent, boundary lines, and a pre-scribed set of rules make tennis one of the most popular sports in the world today. The amusement comprises of stroking a ball with a racket, over a net, until the point when one player misses the ball or hits it into the net or outside the allotted lines. Additionally indicated that the basic systems associated with playing tennis incorporate eye-hand-racket coordination, motor (movement) abilities, and stroking skills. Tennis aptitudes and techniques identify with the mental, physical and technical skill and capacities of a player.

In tennis sport, the players need to capitalize on the opportunities to master the tennis techniques and skills, which is essential. In this sport, the tennis players need to develop a unique style that helps to empower their strengths. The development of such strengths are vital to the progression of an athlete's game, but at times these strengths can expose weaknesses once playing with experienced competitive athletes in the game of tennis. Experienced competitive athletes are craftly in recognizing faults in an opponent's tennis techniques and will take advantage of the opportunities to dominate the situation. Mastering the basic tennis techniques, builds a solid tennis foundation. Mastering these basic tennis techniques and skills is one of the first step to succeed in the sport. Without the foundation of these fundamentals, an athlete generally defaults to failure in the game of tennis. If any of these basic tennis techniques skills is not turned up regularly, an athlete's game is vulnerable against a strong competitor.

Tennis players need to develop awareness, focus and fast decision making. They must have all these three skills well developed. Further on the "speed of action", the "speed of execution" and a "high level of alertness" are necessary to develop the frontal brain lobe and the executive-cognitive functions which take place in that area of the brain.

PROPRIOCEPTION

Proprioception allows the body to perform simultaneous actions without stopping to think about each one separately such as running while dribbling or running and using forehand drive in Tennis. Proprioception training is used to develop precise fluid movements essential for athletes as well as non-athletes.

Thus, the use of proprioception training on novice tennis players will give better results and will be easy to develop flow state of skills.

Hence researcher has selected the topic "Effects of Proprioceptive Training Program (PTP) on selected Physical Fitness Components and Playing Abilities of Novice Tennis Players".

Statement of the Problem

The purpose of the present study will be to find out theEffects of Proprioceptive Training Program (PTP) On the Selected Physical Fitness Components and Playing Abilities of Novice Tennis Players.

Objectives of the Study

1. To assess the physical fitness level of NoviceTennis Players of Madhya Pradesh.
2. To find out the effect of proprioceptive training on selected physical fitness components.
3. To find out the effect of proprioceptive training on selected playing abilities ofNoviceTennis Players of Madhya Pradesh.
4. To prepare proprioceptive training program for Novice Tennis Players of Madhya Pradesh and for other state tennis players.

Hypothesis of the Study

1. Proprioceptive Training will be or will not be improve performance of Speed, Reaction time, Static balance, Dynamic balance, Flexibility, Agility, Grip Strength and Explosive Power.
2. Proprioceptive Training will be or will not beimprove Playing Abilities of Novice Tennis Players.

Delimitations of the Study

1. The study will be delimited to sixty (60) male Tennis players of Gwalior Chambal Tennis Association.
2. The study will be delimited to male Tennis players as aged 12-14 years belonging to Gwalior, M.P. Region.
3. The study will be delimited to Twelve weeks Proprioceptive training program prepared for the present study.
4. The study will be further delimited to the variables selected for the present study.

Limitations of the Study

The researcher will try to coop and provide best conditions for training to the novice Tennis players, still there are certain conditions i.e.,Environmental consideration, surface of the court, motivation level, daily routine, diet and habits of the subjects which may be considered as the limitation of the study.

Significance of the Study

- This study may serve as model for future works and help the coaches, fitness trainers and physical educators to analyze the training program.
- The study will help the profession by way of highlighting the effects of proprioceptive training program(PTP) on novice players.
- The study would add knowledge in the area of sports training.

- The result of the study may bring the awareness among the tennis players and also the other game players.
- The result of the study may help the coaches for enhancing the better performance of Tennis Players.
- The result of the present study would help the coaches, trainers & all other concerned authorities to incorporate the proprioceptive training program (PTP) along with conventional training program.

Definitions of the Terms Used

Tennis Tennis is a racket sport that can be played individually against a single opponent (singles) or between two teams of two players each (doubles). Each player uses a tennis racket that is strung with cord to strike a hollow rubber ball covered with felt over or around a net and into the opponent's court.

Proprioception Proprioceptionalso called kinesthesia, is the body's ability to sense its location, movements, **and** actions. It's the reason we're able to move freely without consciously thinking about our environment. Examples of proprioception include being able to walk or kick without looking at your feet or being able to touch your nose with your eyes closed.

Training Training is a process of preparing an individual for any event or an activity. Sports Training is the Physical, technical, intellectual, Psychological and moral preparation of an athlete or a player by means of physical exercise. Sports training also consists of all those learning, influence and process that are aimed at enhancing Sports performance.

Skill A **Skill** is the learned ability to bring about pre-determined results with maximum certainty; often with the minimum outlay of time or energy or both." Skills can be sub-divided into two categories.

Test A Test is a tool which is used to evaluate the skills, performance, and reliability of the task completed by a sports person**.**

Novice Player A Novice Tennis Player is “someone who has been playing tennis for less than two years and so is not experienced at it.

CHAPTER II

REVIEW OF RELAED LITERATURE

(Aman et al., 2015)Numerous reports advocate that training of the proprioceptive sense is a viable behavioral therapy for improving impaired motor function. However, there is little agreement of what constitutes proprioceptive training and how effective it is. We therefore conducted a comprehensive, systematic review of the available literature in order to provide clarity to the notion of training the proprioceptive system. Methods: Four major scientific databases were searched. The following criteria were subsequently applied: (1) A quantified pre- and post-treatment measure of proprioceptive function. (2) An intervention or training program believed to influence or enhance proprioceptive function. (3) Contained at least one form of treatment or outcome measure that is indicative of somatosensory function. From a total of 1284 articles, 51 studies fulfilled all criteria and were selected for further review. Results: Overall, proprioceptive training resulted in an average improvement of 52% across all outcome measures. Applying muscle vibration above 30 Hz for longer durations (i.e., min vs. s) induced outcome improvements of up to 60%. Joint position and target reaching training consistently enhanced joint position sense (up to 109%) showing an average improvement of 48%. Cortical stroke was the most studied disease entity but no clear evidence indicated that proprioceptive training is differentially beneficial across the reported diseases. Conclusions: There is converging evidence that proprioceptive training can yield meaningful improvements in somatosensory and sensorimotor function. However, there is a clear need for further work. Those forms of training utilizing both passive and active movements with and without visual feedback tended to be most beneficial. There is also initial evidence suggesting that proprioceptive training induces cortical reorganization, reinforcing the notion that proprioceptive training is a viable method for improving sensorimotor function.

(Federici et al., 2020)One of the current trends in the field of sports training concerns the integration into training programs of exercises defined as "proprioceptive", which also include balance exercises, used to optimize performance, prevention or recovery from injuries. After introducing and

describing the main characteristics of proprioceptive training in sports, the present review aims to set out and analyze the various flaws in this type of training as it is commonly practiced, in order to lay the groundwork for future improvements in proprioceptive training. Our research highlights that it is common practice to combine proprioceptive training with training on unstable surfaces, generally meaning the same for both situations. Such practices are indicative of the confusion surrounding the concepts of proprioception and balance. Indeed, until these two concepts and their respective performance benefits are clearly differentiated, it will be difficult to move beyond the controversy surrounding proprioceptive training and hence. to make advances in the field of proprioceptive training research. In conclusion, therefore, against the comforting theories that accompany the use of proprioceptive training in relation to the improvement of performance, unfortunately there is a literature that shows many variables not yet considered or treated in an approximate way.

(Carvalho et al., 2009)Introduction: Traditionally the flexibility exercises have been enclosed as part of the warm-up that precedes a tennis match. However, a controversy exists if the intensity of execution of flexibility would have influence on the athletic performance. The objective of the present study was to verify the acute effect of the static stretching and the proprioceptive neuromuscular facilitation (PNF) on the performance of jump in adolescent tennis players. Materials and Methods: To participate on the experiment it was chosen nine young tennis players, being four of feminine sex and five of the masculine sex, with average age of 14.4 years-old, participants of a tennis school. The group had a warm-up participating of the activities of the tennis lesson and then they executed the jumps. After that a session of trainings of flexibility was carried through immediately after performing new jump. Results: After statistical treatment, the results did not present significant change in the height of jump ($p = 0.66 > 0.05$) between the tests and post test and static and PNF stretching. Discussion: Athletes, who directly need the muscular strength for power generation as the tennis players, seem to not being benefited with exercises of passive stretching or PNF preceding the specific exercise.

(Gidu et al., 2022)The aim of the study was to determine the effects of proprioceptive training (PT) on balance, strength, agility and dribbling in adolescent soccer players. In this research, we included an experimental ($n = 48$) and a control ($n = 48$) group (CG) with 14 years old players. The

experimental group (EG) participated in an 8 week PT program, with four 30 minute sessions per week. The experimental program included 12 bosu ball exercises to improve balance, stability and strength which were grouped into two subprograms: the first not using the soccer ball, the second subprogram using the soccer ball. The subprograms were implemented alternately during 16 proprioceptive training sessions, on two types of firm and foam surfaces. Pre- and post- tests included the static balance [Balance Error Scoring System (BESS)], vertical, horizontal, and lateral jumping, and the completion of agility ("arrowhead") and dribbling ("short dribbling") tests. Regarding the total BESS score, the CG has demonstrated progress between the pre- and the post- test, with 0.780 ± 0.895, fewer errors, while the EG had 5.828 ± 1.017 fewer errors. The difference between the two groups was of 5.148 fewer errors for the EG who had practiced the proposed program of proprioceptive training. The highest difference registered between the pre- and the post- test was at the test "single-leg forward jump with the right leg", with a result of 1.083 ± 0.459 cm for the CG and of 3.916 ± 0. 761 cm for the EG. Through the analysis of average differences between the pre- and the post- tests, we observe that, regarding the "Agility right side test", the EG has progressed with 0.382 s in comparison with the CG; regarding the "Agility left side test", the EG has progressed with 0.233 s compared to the CG; regarding the "Agility right and left side test", the EG has progressed with 0.196 s compared to the CG; in the "Short dribbling test", the EG has progressed with 0.174 s compared to the CG. The highest progress was made at the "Agility right side test", of 0.402 s for the EG, while the CG registered 0.120 s. Most of the results in all tests for both experimental groups show an effect size ranging from small to medium. The progress made by the experimental group in all tests was statistically significant, while in the control group the progress was mostly statistically insignificant for $p < 0.05$. The results suggest that a PT program performed at about 14 years of age could be successfully implemented in the training regime of soccer players to improve components of fitness along with dribbling skills. The results of the study revealed that sports training on the foam surfaces determined a superior progress of the development of proprioception compared to the in-creased training on the firm surfaces.

(Noyes, 2015)Tennis requires speed, agility, and explosive power. Few studies have assessed the effects of a training program in junior players who are not on an elite or national level. We evaluated the impact of a program that combined components of a knee ligament injury prevention program with other exercises to improve athletic performance indicators. We hypothesized

that this program would significantly improve dynamic single-leg balance and function, correct lower limb asymmetry, enhance speed and agility, and improve core endurance.

(Bashir et al., 2019)BACKGROUND: The effect of core training on dynamic balance and agility has yet to be established in literature, especially among junior athletes. OBJECTIVE: To investigate the effect of core training on dynamic balance and agility among Indian junior tennis players. METHOD: Thirty junior tennis players from various parts of Delhi and the national capital region participated in the study. The study featured a pre-test/post-test experimental design. The subjects were divided into the experimental group (mean age = 15.20 ± 0.41, mean BMI = 20.23 ± 1.54) and the control group (mean age = 15.53 ± 1.06, mean BMI = 20.71 ± 1.53). The control group performed regular training, and the experimental group followed a five-week core training program along with regular training. The subjects were evaluated with t-test for agility and the Star Excursion Balance Test (SEBT) for dynamic stability. RESULTS: A significant difference was found in the post-test values of agility (t-test p= 0.000) and dynamic balance using SEBT ((anterolateral; p= 0.00), (lateral; p= 0.02), (posterolateral; p= 0.00), (posterior; p= 0.00), (posteromedial; p= 0.01), (medial; p= 0.03), and (anteromedial; p= 0.03)] except in the anterior direction (p= 0.23)) between the experimental and the control group. The experimental group showed a significant difference in the pre-and post-test values of the t-test and SEBT except in the anterior direction. CONCLUSION: Core training programs can be incorporated safely with players' regular training to improve their dynamic balance and agility, which can eventually lead to better performance.

(*EBSCOhost | 141689462 | Effects of Proprioceptive Training on Agility Performance in Male Football Players.*, n.d.)Background and Purpose: Football is a high intensity intermittent sport which requires the successful and effective execution of the technical skill like agility, change of direction, acceleration, deceleration, sudden stops and shots largely depends on the football players' ability to control their balance and to adapt better and faster to their ever changing bodily postures and positions in the pitch. So to maximize the football performance the possible strategy could be proprioceptive training. Hence, the purpose of this research was to see the ejects of proprioceptive training on agility performance in male football players. Method: 90 football players participated were randomly selected and divided in two groups,

experimental (n=45) and control group (n=45). Experimental group underwent Proprioceptive training on bosu ball with their regular football training program and control group underwent regular football training program. Athletes were trained for 3 times a week for 6 weeks. Agility assessment at pre and post intervention was done for all subjects using T-agility test. Results: The results revealed a significant difference in comparison between pre and post agility for experimental group with p-value 0.000 (< 0.05) and insignificant difference for control group with p-value 0.220 (> 0.05). Conclusion: Proprioceptive training was elective in decreasing the agility time in male football players.

(Bokil et al., 2020)Background: Table tennis is a dynamic sport and is known to be one of the fastest ball games. It has been proven that table tennis requires a short reaction time for success but there is a lack of evidence on the different types of exercises that can improve reaction time in table tennis players. Objective: To study the effectiveness of upper extremity proprioceptive training on reaction time in table tennis players. Methods: 34 Table tennis players, both males and females in the age group of 7-15 were included in the study. They were divided into two groups: Control Group (n=17) and Experimental Group (n=17) by lottery method. The reaction time of all the players was measured using the ruler drop test. The control group underwent a conventional training whereas the experimental group underwent an additional proprioception training along with conventional training for 6 weeks. The reaction times of the players were measured again at the end of 6 weeks. Results: When compared within the group, the reaction time did not show a significant statistical difference in the Control group ($p>0.05$) whereas the reaction time significantly decreased in the experimental group ($p<0.05$). When compared between the groups, reaction time showed a significant statistical difference between the Control and Experimental group ($p<0.05$) indicating that Experimental group produced a significantly shorter reaction time than the Control group at the end of 6 weeks. Conclusion: This study shows that upper extremity proprioceptive training along with conventional training helps to improve reaction time in table tennis players.

(Boyar et al., 2007)Proprioceptive information appears to play an important role in stability and movements of shoulder joint in sporting activities especially in tennis. The purpose of this study was to measure the shoulder proprioceptive sense differences between male tennis players and control group, in sitting and standing positions. 15 young male tennis players with a mean age 14.6

± 0.7 years and 15 young male sedentary individuals with a mean age 14.8 ± 0.9 years participated in this cross-sectional descriptive study. Proprioceptive sense was measured with an isokinetic dynamometer. Measurements were made in two positions: 'sitting' versus 'standing' for forehand and backhand positions. Service motion was measured in sitting position. There was no statistical difference between players and non-players in means of age, body height, weight, and BMI. The study revealed the following results: 1) there was a significant difference between shoulder proprioceptive senses of players and controls ($p<0.05$). 2) significant difference between dominant and non-dominant shoulders at 15°and 30°was not observed ($p<0.05$). 3) no significant difference was observed between sitting and standing positions at 30°($p<0.05$). It was concluded that tennis players had better proprioceptive sense than their age matched sedentary controls. © 2007 - IOS Press and the authors. All rights reserved.

(Lin et al., 2006)The purposes of this study were: (1) to show the differences of lower limb proprioception in three different groups of normal male subjects - elite, amateur, and novice tennis players - and between the skill-dominant and stance-dominant hip and knee and (2) to test the sensitivity of closed-chain reposition test in the three groups. Design: There were 22, 20, and 20 subjects in the three groups, respectively. Proprioception was tested with the closed-chain reposition method. Absolute error and variable error were calculated. One-way analysis of variance and Tukey's test were used to test the differences. Results: The proprioception of the hip joints of the elite players was significantly better than that of the other two groups in absolute error ($P < 0.0167$). In variable error analysis, the proprioception of the stance-dominant leg of the elite players was significantly better than that of the novice players ($P < 0.0033$). Conclusions: Findings of this study supported that the proprioception of elite players was the best. The closed-chain reposition test had good discriminating power between the elite players and the others. Copyright © 2006 by Lippincott Williams & Wilkins.

(Jerosch et al., 1997)In 60 adolescent volunteers aged 8 to 16 years we assessed the proprioceptive capability of the shoulder complex by an angle reproduction test. The purpose of the study was to evaluate the proprioceptive capability of adolescent tennis players. 40 were tennis players. 20 non

tennis players served as a control group. Documentation of the reproduced angle was performed by a motion analyzing system with passive markers. Angle reproduction of all volunteers was best in the midrange of motion (100° flexion, 100° abduction, neutral rotation in 90° abduction). The worst results were documented below shoulder level (50° flexion, 50° abduction, internal rotation in 90° abduction). A correlation to sex or dominant extremity could not be found. Subjects older than 12 years showed a tendency for better angle reproduction compared to the younger subjects. Tennis players older than 12 years demonstrated significant better capabilities for angle reproduction in some movements of the shoulder complex.

CHAPTER III

METHODOLOGY

In this chapter, procedures and methods applied in the selection of subjects, selection of variables, selection of tests, competency of the tester, orientation to the subjects, collection of data, administration of test, statistical procedure is presented.

Selection of Subjects:

Sixty (60) male Novice Tennis players of Gwalior Chambal Tennis Association, M.P.State, India will be selected purposively as subjects for the study. The age of the subjects ranged between 12-14 years. Subjects will be randomly categorized into experimental group (30) and control group (30). The subjects will be voluntary participate in the study and will provide written consent.

Selection of Variables:

1. Proprioceptive training for the present study will be independent variable. The Proprioceptive training program will be constructed for 5 days/week, once/day and will be given to all the selected subjects for 12 weeks. All the selected parameters will be assessed before the intervention of the training program i.e., at baseline level, after 6 weeks & finally after 12 weeks of the training program. The total duration of each session will be30 minutes. Repetition exercise will start with 8 repetitions /day which will increased to 20 repetitions /day & for timed

exercise started from 20 seconds hold which will increased by 5 seconds/day, until 20 repetitions and 60 seconds hold for each exercise will be obtained till the last day of the week. 10-15 minutes of warming up session will be prepared before the commencement of training program, so that the body gets itself prepared for the training. The progression of training load (exercise) will be according to the principles of training i.e., it will be increased gradually in relation to the principle of load adaptation.

Total duration of training = 12 weeks

Total duration assigned for each session = 30 minutes

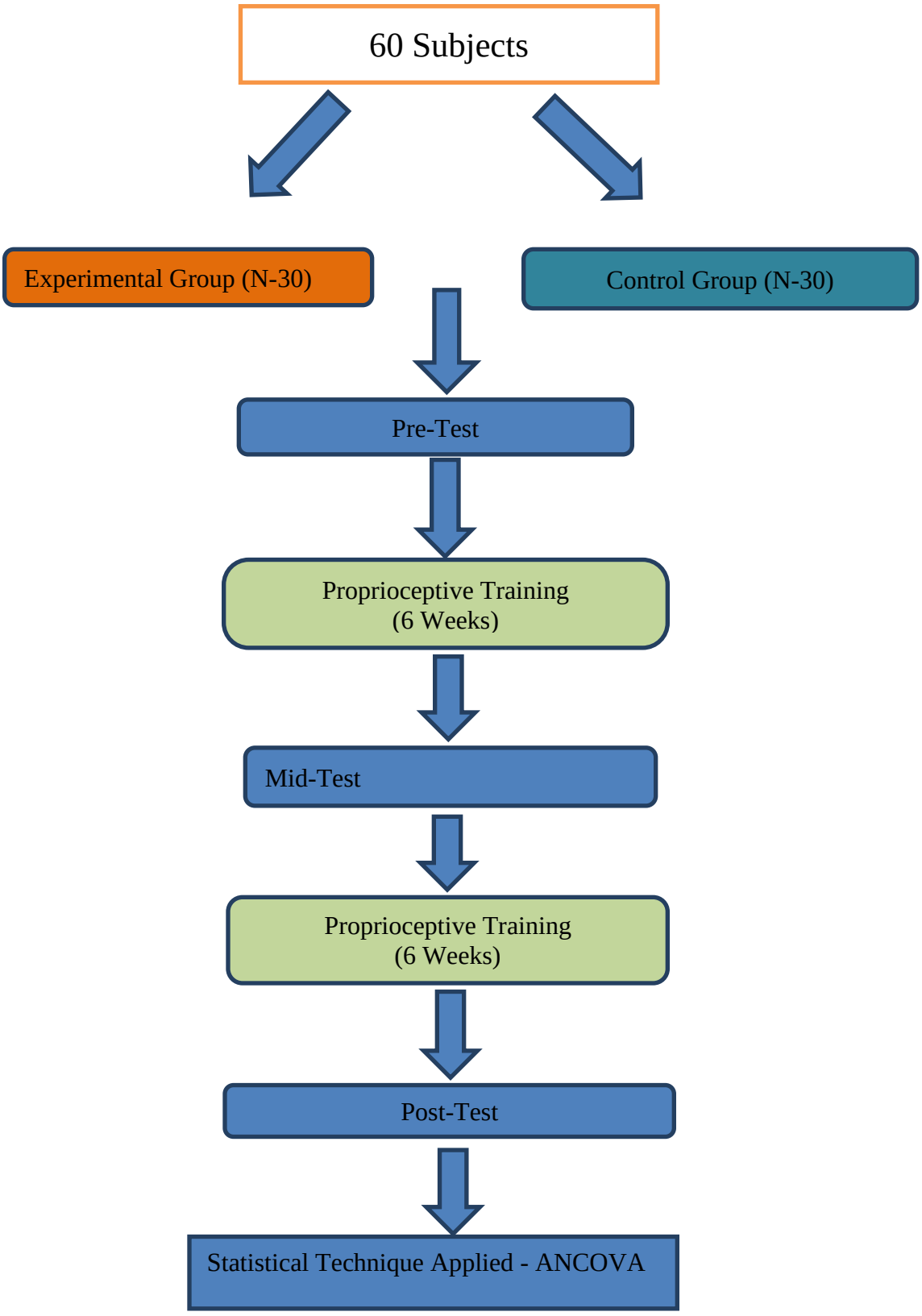
Sessions = 5 sessions /week.

2. Physical fitness variables& Playing Abilities will be dependent variables: The details are–

S.No.	Dependent variable	Test
1	Static balance	Stand Stork Test
2	Dynamic balance	Johnson Modified Test
3	Speed	20 m. Dash
4	Agility	Spider Drill Test (ITF Approved)
5	Flexibility	Sit and Reach Test
6	Explosive Power	Standing Vertical Jump Test
7	Reaction Time	Nelson Reaction Time Test
8	Hand Grip Strength	Hand Grip Strength Test

S.No.	Playing Abilities	Test
1	Forehand Ground Stroke	ITN/ITF Test
2	Backhand Ground Stroke	ITN/ITF Test
3	Volley	ITN/ITF Test
4	Service	ITN/ITF Test

Figure: Flow chart of Experimental Design



Orientation of Subject

All subjects will be instructed prior to the test.The investigator willdemonstratethe exercises, skills and tests to be performed. The procedures and purpose of the test will be explained in detail to the subjects to make them understand and effective co-operation to obtain accurate and reliable data.

Criterion Measures

The criterion measures for this study will be Novice Tennis Player's of Gwalior Chambal tennis Association as subjects and the test and re-test scores of the various physical fitness components and skill tests for forehand, backhand, volley and serve skills. Retest score will be obtained to established the reliability and objectivity of the tests.

Reliability of the Data & Test

The reliability of data was established by using test and re-test method, which will be implemented to 60 subjects. All the subjects will appear in the test and re-test. All the variables which are selected for the study will be tested by the same person with the same instrument under identical conditions on the same subjects.The reliability of the data will be ensured through -

(1) Reliability of the instruments to be used.

(2) Reliability of Testers.

Reliability of Instruments

Tennis balls approved by the All-India Tennis Association, standard racket, standard Tennis court, and measuring tapes will be used for tests, tennis court and racket considered reliable as they were standard and fulfill all the ITF conditions and will used for professional tournaments purpose.

For the various physical fitness tests concern associations and federations approved Stop watch, whistle, measuring tape and other required items will be used for the above purpose.

Tester's Reliability

The investigator will provide all the information and give proper instructions before conducting the tests. The Tennis experts from Gwalior Chambal Tennis Association, who have worked in the tennis field for more than 10 years and have ample exposure on the skills, skill tests, playing conditions and assessment of the subjects both in micro and macro levels and are certified from Sports Authority of India, and All India Tennis Association will be considered for the purpose of the study.

Administration of Test and Collection of Data

Data for the Forehand, Backhand, Volley and Service testsand various physical fitness components will be collected before and after implementing the Proprioceptive Training Program (PTP) by administering the appropriate tests. The purpose and procedure will be explained in detail to the subjects before administering the test.

Tools and Equipment'srequired:

1. Tennis Racket
2. Balls
3. Ball Basket
4. Measuring Tape
5. Color Paper Tape or chalk
6. Stop Watch etc.

Sample Weekly Plan

Exercises	Description	Repetition Rate	Duration /Sets	Diagram
1.Leg Balance Starting with 10rep of 10 sec with10-20 secrest, Adding2-5repetitionseach day,	Standonleftlegstanceand swingthearmsback&forth At moderate pace starting with10 repetitions. Rest of 10-20 secondsbetweeneachrepetition.	8-10 Repetitions with 20 sec rest between each repetition for each set with eachleg,30 secrestbetween eachSet.	2 Sets	
2.forward-backward legswing with kneeextended Starting with 10 repetitions,Adding 2-5 rep each daywith10-20secrestbetweeneachrepetition.	Standonleftlegstanceandraise rightlegwithkneeextended swingdownwardandbackward untiltherightleggetsextended behindyourbody. Repeatthe samewithotherleg.	8-10 repetitions With20sec Restbetween eachrepetition and 30 sec rest between each set.	2 Sets	
3.Toe Walking Startwalk with moderate pace	Walkontoesstraightaheadfor first10meters,thensecond10 meters with toes pointing outward and third 10 meters withtoespointinginwith moderate pace.	2Repetitions With20sec Restbetween eachrepetition and 30 sec rest between each set..	3 Sets	
4.Heel Walking Startwalk with moderate pace	Subjectisaskedtowalkonthe Heel withtoesstraightaheadfor first10 meters, thensecond10 meters on heels with toes pointingoutwardandthird10 meters on heels with toes pointingin with moderate pace.	2repetitions with20secrest Between each Repetitions and 30 sec rest between each set..	3 Sets	

2nd week onwards Further advancement/variations will take place with the uses of Swiss Ball, Aerobic Board, Medicine Ball, Resistance Belt etc.

SELECTION OF TESTS

Alltheselected variableswill be measuredthrough standardtest i.e.

1. **StorkStandTest(StaticBalance;Jenson,1970)**

Objective: The test will be used to measure the static balance of the subjects on the ball offoot.

2. **JohnsonModifiedBassticktest (Dynamicbalance;Johnson &Leach,1968)**

Objective: To measure ability to jump accurately & maintain balance.

3. **AgilityTest (Spider Drill Test, ITF Fitness Assessment)**(Scott, n.d.)

Objective: The purpose of the test will be to assess agility of the subjects.

4. **20MetersDash (ITF Fitness Assessment)**

Objective: The purpose of the test will be to measure the speed of the subject.

5. **Sit&Reach Test(Flexibility, WellsandDillon,1952)**

Objective: The purposeof the test will betomeasure theflexibility oflowerback&hamstringmuscles.

6. **Nelson footreactiontimetest(Nelson,1967)**

Objective: The purpose of the test will be to measure the reaction time of foot movement inresponse to visual stimulus.

7. **StandingVertical Jump Test(ExplosivePower,ITF Fitness Assessment)**

Objective: Thepurposeofthetestwill betomeasuretheexplosivenessofthelowerextremities.

8. **Handgrip Strength Test**

   Objective: The purpose of the test to measure the flexor musculature strength of forearm of the subjects. Equipment Grip Dynamometer (Takei 5401 Digital Dynamometer).

   Personnel Required: One recorder/tester.

For the assessment of Playing Abilities ITN/ITF approved test will be applied.

COLLECTION OF DATA

The data will be collected by administering the tests for the chosen variables such as Standing Vertical Jump test, 20 m. dash, Spider Drill Agility Test, Hand Grip strength Test, JohnsonModifiedBassticktest - for dynamic Balance, StorkStandTest–for StaticBalance, Sit and reach test and for Tennis playing abilities ITN/ITF approved tests.

The test will be administered in the Tennis complex of Gwalior Chambal Tennis Association and LNIPE campus, Gwalior. To ensure uniformity, collection of data will performed only during specific time i.e. between 4.00 pm to 6.00 pm, 15 days will be utilized in the collection of data each time.

Procedure of Administering test

The selected subjects for this study will be assembled at tennis complex of Gwalior Chambal Tennis Association, Gwalior. They will be oriented regarding the objectives and requirementsof the test items. The subjects will be requested and motivated for the the whole hearted participation towards the success of the study.

Different stations will be formed for the administering the test. The assigned exercises will be explained and demonstrateed by the research scholarbefore asking them to perform. After demonstration only they will be asked to perform by the participants.

STATISTICAL TECHNIQUE

Descriptive statistics will be used to determine status of selected Physical Fitness Components & Playing Abilities before, during and after the Proprioceptive Training Program. ANCOVA will be used to observe the effect of 12 weeks Proprioceptive Training on selected Physical Fitness Components &Playing Abilities at different intervals.

The level of significance will be set at 0.05 & the data will be analyzed using Statistical package for Social Science (SPSS).

BIBLIOGRAPHY

AAHPERD, (1980). Health related physical fitness test: Technical manual. Reston, VA.

Kamlesh, M. L. (2011). UGC NET digest paper III, Physical education. New Delhi, India: Khel Sahitya Kendra.

Crespo, Miguel (1998). ITF Advance Coaches Manual

https://www.itftennis.com/.../articles/tennis-science-flexibility-training

https://faulttoleranttennis.com/what-is-proprioception-anyway

https://www.tennis-warrior.com/blog/neuro-athletic-training-for-tennis

Aman, J. E., Elangovan, N., Yeh, I. L., & Konczak, J. (2015). The effectiveness of proprioceptive training for improving motor function: A systematic review. *Frontiers in Human Neuroscience*, *8*(JAN). https://doi.org/10.3389/fnhum.2014.01075

Bashir, S. F., Nuhmani, S., Dhall, R., &Muaidi, Q. I. (2019). Effect of core training on dynamic balance and agility among Indian junior tennis players. *Journal of Back and Musculoskeletal Rehabilitation*, *32*(2), 245–252. https://doi.org/10.3233/BMR-170853

Bokil, C., Bisen, R., & Kalra, K. (2020). Effectiveness of Upper Extremity Proprioceptive Training on Reaction Time in Table Tennis Players. *International Journal of Health Sciences and Research (Www.Ijhsr.Org)*, *10*(5), 34. www.ijhsr.org

Boyar, A., Salci, Y., Kocak, S., &Korkusuz, F. (2007). Shoulder proprioception in male adolescent tennis players and controls: The effect of shoulder position and dominance. *Isokinetics and Exercise Science*, *15*(2), 111–116. https://doi.org/10.3233/IES-2007-0257

Carvalho, F., Prati, J., Carvalho, M., & Dantas, E. (2009). Acute effects of static stretching and proprioceptive neuromuscular facilitation on the performance of vertical jump in adolescent tennis players. *Fitness & Performance Journal*, *8*(4), 264–268. https://doi.org/10.3900/FPJ.8.4.264.E

EBSCOhost | 141689462 | Effects of Proprioceptive Training on Agility Performance in Male Football Players. (n.d.). Retrieved May 21, 2022, from https://web.s.ebscohost.com/abstract?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=09735674&AN=141689462&h=6AU5izXoYb77DElRFv%2bdAkzumZhHXVcanxm1iIGXwwxN3YcJwe3K04DcIX1Ue625KgER7PfsGeTuSX3uZJBXiw%3d%3d&crl=c&resultNs=AdminWebAuth&resultLocal=ErrCrlNotAuth&crlhashurl=login.aspx%3fdirect%3dtrue%26profile%3dehost%26scope%3dsite%26authtype%3dcrawler%26jrnl%3d09735674%26AN%3d141689462\\\

Federici, A., Zumbo, F., Lucertini, F., & Marini, C. F. (2020). Proprioceptive training and sports performance. *Journal of Human Sport and Exercise*, *15*(Proc4). https://doi.org/10.14198/jhse.2020.15.Proc4.17

Gidu, D. V., Badau, D., Stoica, M., Aron, A., Focan, G., Monea, D., Stoica, A. M., & Calota, N. D. (2022). The Effects of Proprioceptive Training on Balance, Strength, Agility and Dribbling in Adolescent Male Soccer Players. *International Journal of Environmental Research and Public Health*, *19*(4). https://doi.org/10.3390/ijerph19042028

Jerosch, J., Thorwesten, L., &Teigelkötter, T. (1997). [Proprioception of the shoulder joint in young tennis players]. *SportverletzungSportschaden : Organ Der Gesellschaft Fur Orthopadisch-TraumatologischeSportmedizin*, *11*(1), 1–9. https://doi.org/10.1055/S-2007-993356

Lin, C. H., Lien, Y. H., Wang, S. F., &Tsauo, J. Y. (2006). Hip and knee proprioception in elite, amateur, and novice tennis players. *American Journal of Physical Medicine and Rehabilitation*, *85*(3), 216–221. https://doi.org/10.1097/01.PHM.0000200376.12974.41

Noyes, F. (2015). *A six-week neuromuscular and performance training program improves speed, agility, dynamic balance, and core endurance in junior tennis players*. https://doi.org/10.4172/2324-9080.1000185